REMARKS

Claims 1-18 stand rejected under 35 U.S.C. § 102(a) as being anticipated by Krasner et al. (U.S. Patent Number 6,665,541, hereinafter "Krasner"). Respectfully disagreeing with these rejections, reconsideration is requested by the applicant.

Independent claim 1 recites "receiving, at a master site, information from a GPS satellite that indicates a position of the satellite and a satellite time-of-day." Regarding this portion of claim 1, the Examiner cites Krasner column 1, lines 42-54 and column 4, lines 24-38 as teaching this claim language. Column 1, lines 42-54 reads (emphasis added):

> An alternative method, called EOTD, measures at the mobile the times of arrival of signals transmitted from each of several basestations. FIG. 1 applies to this case if the arrows of TR 1 , TR 2 and TR 3 are reversed. This timing data may then be used to compute the **position of the mobile.** Such computation may be done at the mobile itself or at a location server, if the timing information so obtained by the mobile is transmitted to this server via the link. Again, the **basestation times-of-day** must be coordinated and their location accurately assessed. In either approach, the locations of the basestations are determined by standard surveying methods and may be stored in the basestation or at the server in some type of computer memory.

Column 4, lines 24-51 reads (emphasis added):

> In a network such as GSM, **the time-of-day information from the GPS receiver** may be used to time-tag the framing structure of the received communication (e.g. GSM) signal. For example, the start of a particular GSM frame boundary, which occurs every 4.6 milliseconds, may be used (see FIG. 8). There are 2048 such frames per superframe, which lasts 3. 48 hours. Hence, if this timing information is passed via normal cellular signaling to the basestation (BS) (e.g. a cellular basestation shown in FIG. 3), the only major error left in transferring time is the propagation time from the mobile station (MS) (e.g. the mobile cellular communication station of FIG. 2) to the BS. Of course, some other residual errors may remain, such as multipath delays and transit delays through the MS hardware, and methods for accounting for these residual errors are described below.
> A variety of methods may be used to estimate the aforementioned MS-to- BS propagation delay. A first and highly accurate approach can be employed when the MS and/or server have accurately determined the MS position via the GPS unit, and the BS location is

> precisely known (e.g. predetermined knowledge via survey). In this case, the propagation time may be determined (typically at some network entity) by dividing BS-MS range by the speed of light. Then the BS may determine the timing of its transmitted frame marker by simply subtracting the computed propagation time from the frame marker timing provided by the MS. This method is described further below in conjunction with FIGS. 5A, 5 B, 6 A and 6 B.

The applicant submits that these passages of Krasner fail to teach or suggest receiving, at a master site, **information from a GPS satellite that indicates a position of the satellite** and a satellite time-of-day, as claim 1 recites.

Independent claim 1 recites "determining, using the position of the satellite and a pre-determined position of the master site, a time-of-day error value that represents a difference between the satellite time-of-day, adjusted for a transit time of the information, and a corresponding master site time-of-day as reported by a master site, nanosecond-accurate clock." Regarding this portion of claim 1, the Examiner cites Krasner column 5, lines 19-49, Krasner column 5, lines 55-65, Krasner column 1, line 66 – column 2, line 19, and Krasner column 10, line 59 – column 11, line 13 as teaching this claim language. Column 5, lines 19-49 reads (emphasis added):

> FIG. 4 shows one exemplary method according to an embodiment of the present invention. In operation 151 the mobile cellular system determines a representation of its time-of-day at the mobile cellular communication station. In one embodiment where a GPS receiver, such as GPS receiver 52, is used within a mobile cellular communication station, such as indicated by 50 shown in FIG. 2, GPS time may be obtained at the MS by reading GPS time off the GPS signals from the GPS satellites. Alternatively, a technique for determining time as described in U.S. Pat. No. 5,812,087 may be utilized. In this approach, a sample of the GPS signals received at the mobile may be transmitted to a location server or to some other server where this record is processed to determine the time of receipt as described in U.S. Pat. No. 5,812,087. Further, the time-of-day in operation 151 may alternatively be computed using one of the various methods described in co-pending application Ser. No. 09/062,232 which was filed Apr. 16, 1998. The method shown in FIG. 4 continues in operation 153 in which the propagation delay between the mobile cellular communication station and a cellular basestation, such as the cellular basestation shown in FIG. 3, is determined. It will be appreciated that in certain of the embodiments described above, this operation is optional where the time determined in operation 151 has more error associated with it than the propagation delay. Also as noted above, this propagation delay may be determined by determining the **position of the mobile** (by means of processing the GPS signals) and determining the **position of the cellular basestation**. The distance between these two positions divided by the speed of light will determine the propagation delay in operation 153.

Column 5, lines 55-65 reads (emphasis added):

Each cellular basestation in a network may employ this procedure in order to synchronize all the basestations relative to one time standard, such as GPS time. In this manner, improved triangulation, or ranging, based upon the use of timing information sent between each of several basestations and a mobile system, may be obtained. Many other uses of timing information may be made. These include allowing more efficient "handoff" of a mobile's communications from one basestation to the next basestation, and permitting unambiguous time to be transmitted throughout the network for various purposes.

Column 1, line 66 – column 2, line 19 reads (emphasis added):

It should be clear from the above description, that for EOTD or TDOA, time coordination between the various cellular basestations is necessary for accurate **position calculation of the mobile**. The required time-of-day accuracy at the basestations depends upon details of the positioning method utilized. In one method the round trip delay (RTD) is found for signals that are sent from the basestation to the mobile and then are returned. In a similar, but alternative, method the round trip delay is found for signals that are sent from the mobile to the basestation and then returned. Each of these round trip times are divided by two to determine an estimate of the one-way time delay. Knowledge of the location of the basestation, plus a one-way delay constrains the location of the mobile to a circle on the earth. Another measurement with a second basestation then results in the intersection of two circles, which in turn constrains the location to two points on earth. A third such measurement resolves the ambiguity. With round trip timing it is important that the measurements with the several basestations be coordinated to several seconds, at worst, so that if the mobile is moving rapidly, the measurements will correspond to those occurring at the same location.

Column 10, line 59 – column 11, line 13 reads (emphasis added):

If the basestation has a highly stable clock, then one may use this clock to maintain time between updates from the remote mobile units. The clock may be used in the smoothing process to eliminate poor **measurements from the mobiles** due to multipath. Furthermore, the measurements from the mobile may be used to measure the long term stability of the basestation clock, due to aging, for example. As an example, a GSM hyperframe is around 3.48 hours and a superframe is 6.12 seconds. Accordingly, a hyperframe is around 12528 seconds. A typical GPS time measurement, without differential corrections should be accurate to around 100 nanoseconds. This accuracy allows a measurement of long term frequency of the basestation oscillator equal to around 100 nanoseconds/12528 seconds=8×10^{-12}. Even the measurement over a period of 6.12 seconds allows an accuracy of long-term frequency of around 1.6×10^{-8}. This

> measurement of long term stability is best done by making several time-of-day measurements **with the same mobile receiver**. Hence, a stationary or slowly moving mobile is best suited for this purpose. Successive measurements of the **mobiles position** will provide the required information regarding the mobile receiver's dynamics.

The applicant submits that these passages of Krasner fail to teach or suggest determining, **using the position of the satellite** and a pre-determined position of the master site, a **time-of-day error value** that represents a **difference between** the **satellite time-of-day, adjusted for a transit time of the information, and** a corresponding **master site time-of-day** as reported by a master site, nanosecond-accurate clock, as claim 1 recites.

Independent claim 1 recites "broadcasting to at least one slave site an indication of the time-of-day error value and the corresponding master site time-of-day." Regarding this portion of claim 1, the Examiner cites Krasner column 4, lines 24-51 as teaching this claim language. Column 4, lines 24-51 reads (emphasis added):

> In a network such as GSM, **the time-of-day information from the GPS receiver** may be used to time-tag the framing structure of the received communication (e.g. GSM) signal. For example, the start of a particular GSM frame boundary, which occurs every 4.6 milliseconds, may be used (see FIG. 8). There are 2048 such frames per superframe, which lasts 3. 48 hours. Hence, if this **timing information is passed via normal cellular signaling to the basestation (BS) (e.g. a cellular basestation shown in FIG. 3), the only major error left in transferring time is the propagation time <u>from the mobile</u> station (MS) (e.g. the mobile cellular communication station of FIG. 2) <u>to the BS</u>**. Of course, some other residual errors may remain, such as multipath delays and transit delays through the MS hardware, and methods for accounting for these residual errors are described below.
>
> A variety of methods may be used to estimate the aforementioned **MS-to- BS** propagation delay. A first and highly accurate approach can be employed when the MS and/or server have accurately determined the MS position via the GPS unit, and the BS location is precisely known (e.g. predetermined knowledge via survey). In this case, the propagation time may be determined (typically at some network entity) by dividing BS-MS range by the speed of light. Then the BS may determine the timing of its transmitted frame marker by simply subtracting the computed propagation time from the frame marker timing provided by the MS. This method is described further below in conjunction with FIGS. 5A , 5 B, 6 A and 6 B.

The applicant submits that this passage of Krasner fails to teach or suggest broadcasting **to at least one slave site** an indication of <u>the</u> **time-of-day error value**

and the **corresponding master site time-of-day**, as claim 1 recites.

Independent claim 6 recites "receiving, at a slave site and at a time indicated by a slave site clock, information from a GPS satellite that indicates a position of the satellite and a first satellite time-of-day." Regarding this portion of claim 6, the Examiner cites Krasner column 3, lines 6-33 as teaching this claim language. Column 3, lines 6-33 reads (emphasis added):

> The present invention provides various methods and apparatuses for synchronizing cellular basestations in a cellular network. One exemplary method performs time synchronization between at least two basestations, a first basestation and a second basestation, of a cellular communication system. In this exemplary method, **a first time-of-day and a first location of a first mobile cellular station (MS) are determined** from a first satellite positioning system (SPS) receiver which is co-located with the first mobile station (MS), and the first time-of-day and first location are transmitted by the first MS to a first basestation which determines a time-of-day of the first basestation from the first time-of- day and first location and from a known location of the first basestation. Also in this exemplary method, a second time-of-day and a second location of a second MS are determined from a second SPS receiver which is co-located with the second MS, and the second time-of-day and the second location are transmitted to a second basestation which determines a time-of-day of the second basestation from the second time-of-day and the second location and a known location of the second basestation. Since these mobile stations may be used for normal communication operations and are not necessarily fixed to a building or structure, their use for timing a network avoids the high cost of real estate to maintain fixed timing equipment. Other methods and apparatuses are also described for synchronizing basestations in a cellular network.

The applicant submits that this passage of Krasner fails to teach or suggest receiving, at a slave site and at a time indicated by a slave site clock, information from a GPS satellite that indicates a **position of the satellite** and a first satellite time-of-day, as claim 6 recites.

Independent claim 6 recites "storing information that indicates the time indicated by the slave site clock and how the time indicated by the slave site clock differs from the satellite time-of-day." Regarding this portion of claim 6, the Examiner cites Krasner column 1, lines 42-54 and column 4, lines 24-38 as teaching this claim language. Column 1, lines 42-54 reads (emphasis added):

> An alternative method, called EOTD, measures at the mobile the times of arrival of

> signals transmitted from each of several basestations. FIG. 1 applies to this case if the arrows of TR 1 , TR 2 and TR 3 are reversed. This timing data may then be used to compute the **position of the mobile**. Such computation may be done at the mobile itself or at a location server, if the timing information so obtained by the mobile is transmitted to this server via the link. Again, the **basestation times-of-day** must be coordinated and their location accurately assessed. In either approach, the locations of the basestations are determined by standard surveying methods and may be stored in the basestation or at the server in some type of computer memory.

Column 4, lines 24-51 reads (emphasis added):

> In a network such as GSM, **the time-of-day information from the GPS receiver** may be used to time-tag the framing structure of the received communication (e.g. GSM) signal. For example, the start of a particular GSM frame boundary, which occurs every 4.6 milliseconds, may be used (see FIG. 8). There are 2048 such frames per superframe, which lasts 3. 48 hours. Hence, if this timing information is passed via normal cellular signaling to the basestation (BS) (e.g. a cellular basestation shown in FIG. 3), the only major error left in transferring time is the propagation time from the mobile station (MS) (e.g. the mobile cellular communication station of FIG. 2) to the BS. Of course, some other residual errors may remain, such as multipath delays and transit delays through the MS hardware, and methods for accounting for these residual errors are described below.
> A variety of methods may be used to estimate the aforementioned MS-to- BS propagation delay. A first and highly accurate approach can be employed when the MS and/or server have accurately determined the MS position via the GPS unit, and the BS location is precisely known (e.g. predetermined knowledge via survey). In this case, the propagation time may be determined (typically at some network entity) by dividing BS-MS range by the speed of light. Then the BS may determine the timing of its transmitted frame marker by simply subtracting the computed propagation time from the frame marker timing provided by the MS. This method is described further below in conjunction with FIGS. 5A , 5 B, 6 A and 6 B.

The applicant submits that these passages of Krasner fail to teach or suggest storing information that indicates the **time indicated by the slave site clock** and **how the time indicated by the slave site clock differs from the satellite time-of-day**, as claim 6 recites.

Independent claim 6 recites "receiving, at the slave site, an indication of a time-of-day error value and a corresponding master site time-of-day, as reported by a master site, nanosecond-accurate clock, wherein the time-of-day error value represents a difference between a second satellite time-of-day, adjusted for a transit time to the master site, and the corresponding master site time-of-day." Regarding this portion of

claim 6, the Examiner additionally cites Krasner column 1, line 66 – column 2, line 19, and Krasner column 10, line 59 – column 11, line 13 as teaching this claim language. Column 1, line 66 – column 2, line 19 reads (emphasis added):

> It should be clear from the above description, that for EOTD or TDOA, time coordination between the various cellular basestations is necessary for accurate **position calculation of the mobile**. The required time-of-day accuracy at the basestations depends upon details of the positioning method utilized. In one method the round trip delay (RTD) is found for signals that are sent from the basestation to the mobile and then are returned. In a similar, but alternative, method the round trip delay is found for signals that are sent from the mobile to the basestation and then returned. Each of these round trip times are divided by two to determine an estimate of the one-way time delay. Knowledge of the location of the basestation, plus a one-way delay constrains the location of the mobile to a circle on the earth. Another measurement with a second basestation then results in the intersection of two circles, which in turn constrains the location to two points on earth. A third such measurement resolves the ambiguity. With round trip timing it is important that the measurements with the several basestations be coordinated to several seconds, at worst, so that if the mobile is moving rapidly, the measurements will correspond to those occurring at the same location.

Column 10, line 59 – column 11, line 13 reads (emphasis added):

> If the basestation has a highly stable clock, then one may use this clock to maintain time between updates from the remote mobile units. The clock may be used in the smoothing process to eliminate poor **measurements from the mobiles** due to multipath. Furthermore, the measurements from the mobile may be used to measure the long term stability of the basestation clock, due to aging, for example. As an example, a GSM hyperframe is around 3.48 hours and a superframe is 6.12 seconds. Accordingly, a hyperframe is around 12528 seconds. A typical GPS time measurement, without differential corrections should be accurate to around 100 nanoseconds. This accuracy allows a measurement of long term frequency of the basestation oscillator equal to around 100 nanoseconds/12528 seconds=8×10^{-12}. Even the measurement over a period of 6.12 seconds allows an accuracy of long-term frequency of around 1.6×10^{-8}. This measurement of long term stability is best done by making several time-of-day measurements **with the same mobile receiver**. Hence, a stationary or slowly moving mobile is best suited for this purpose. Successive measurements of the **mobiles position** will provide the required information regarding the mobile receiver's dynamics.

The applicant submits that these passages of Krasner fail to teach or suggest receiving, at the slave site, an indication of a **time-of-day error value** and a **corresponding master site time-of-day**, as reported **by a master site**, nanosecond-accurate **clock**, wherein the time-of-day error value represents a **difference between** a **second**

satellite time-of-day, adjusted for a transit time to the master site, and the **corresponding master site time-of-day**, as claim 6 recites.

Independent claim 6 recites "determining a clock correction value for the slave site using the stored information, the time-of-day error value, and the corresponding master site time-of-day; and synchronizing a slave site clock with the master site using the clock correction value." Regarding this portion of claim 6, the Examiner cites Krasner column 4, lines 24-38, Krasner column 4, lines 52-67, and Krasner column 11, lines 14-27 as teaching this claim language. Column 4, lines 24-51 reads (emphasis added):

> In a network such as GSM, **the time-of-day information from the GPS receiver** may be used to time-tag the framing structure of the received communication (e.g. GSM) signal. For example, the start of a particular GSM frame boundary, which occurs every 4.6 milliseconds, may be used (see FIG. 8). There are 2048 such frames per superframe, which lasts 3. 48 hours. Hence, if this timing information is passed via normal cellular signaling **to the basestation (BS)** (e.g. a cellular basestation shown in FIG. 3), the only major error left in transferring time is the propagation time **from the mobile station** (MS) (e.g. the mobile cellular communication station of FIG. 2) to the BS. Of course, some other residual errors may remain, such as multipath delays and transit delays through the MS hardware, and methods for accounting for these residual errors are described below.
>
> A variety of methods may be used to estimate the aforementioned MS-to- BS propagation delay. A first and highly accurate approach can be employed when the MS and/or server have accurately determined the MS position via the GPS unit, and the BS location is precisely known (e.g. predetermined knowledge via survey). In this case, the propagation time may be determined (typically at some network entity) by dividing BS-MS range by the speed of light. Then the BS may determine the timing of its transmitted frame marker by simply subtracting the computed propagation time from the frame marker timing provided by the MS. This method is described further below in conjunction with FIGS. 5A , 5 B, 6 A and 6 B.

Column 4, lines 52-67 reads (emphasis added):

> A second and less precise **approach to estimating the MS-to-BS propagation delay** is made possible by "timing advance" information already available within the MS and BS. The originally intended purpose of such information concerns intra-cell traffic coordination. However, timing-advance metrics can be manipulated in a straightforward manner to yield these MS-to-BS delay estimates. The accuracy afforded by such time alignment parameters is primarily determined by the time resolution of the communication bit intervals involved. Thus it is possible to achieve propagation delay

> estimates accurate to within a few or several tens of microseconds. Although less precise than the first delay estimation approach above, this second approach is particularly advantageous in situations where privacy concerns preclude network manipulation of the exact MS position.

Column 11, lines 14-27 reads (emphasis added):

> If there is significant user motion, then it is important that any **Doppler related effects** do not influence the timing measurements described above. In particular, if the mobile measures time at one instance and is predicting the time-of-day associated with a cellular signal frame boundary occurring at a different instance, an error can result due to the mobile's motion. This is especially the case if the mobile is rapidly moving and/or the difference in these time instances is large. There are a number of ways to deal with this type of problem. For example, if the mobile can determine its velocity, then this data may be supplied to the basestation which can then compensate for errors due to the Doppler associated with the range rate **between the mobile and the basestation.**

The applicant submits that these passages of Krasner fail to teach or suggest determining a clock correction value **for the slave site** using the stored information, **the time-of-day error value**, and **the corresponding master site time-of-day** and **synchronizing** a slave site clock with the master site **using the clock correction value**, as claim 6 recites.

Since claim 12 contains much of the same language as claim 6, the same comments apply to claim 12, as well. In general, Krasner differs considerably from the present application. Most notably, the Krasner BS synchronization embodiments involve MS-to-BS signaling for synchronization purposes. The present application describes synchronization that does not rely on signaling from an MS. It appears to the applicant that the Examiner has relied on various disjointed portions of Krasner for teaching very specific aspects of the claims (most of which the applicant disagrees with). Additionally however, what appears to be missing when these portions of Krasner are read is how can Krasner be said to teach a different approach (i.e., the present application's approach) when the "pieces of Krasner" must be artificially rearranged to assert that Krasner does teach the different approach.

Since none of the references cited, either independently or in combination, teach all of the limitations of independent claims 1, 6 or 12, or therefore, all the limitations of their respective dependent claims, it is asserted that neither anticipation nor a prima

facie case for obviousness has been shown. No remaining grounds for rejection or objection being given, the claims in their present form are asserted to be patentable over the prior art of record and in condition for allowance. Therefore, allowance and issuance of this case is earnestly solicited.

The Examiner is invited to contact the undersigned, if such communication would advance the prosecution of the present application. Lastly, please charge any additional fees (including extension of time fees) or credit overpayment to Deposit Account No. **502117 – Motorola, Inc.**

Respectfully submitted,
B. Drawert

By: [signature]

Jeffrey K. Jacobs
Attorney for Applicant(s)
Registration No. 44,798
Phone No.: 847/576-5562
Fax No.: 847/576-3750